National Institute of Environmental Health Sciences

Impacts of heat and ozone on mortality risk in the New York City metropolitan region under a changing climate seasonal forecasts, climatic change and human health

Author(s):	Knowlton K, Hogrefe C, Lynn B, Rosenzweig C, Rosenthal J, Kinney PL
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Abstract:

Climate change may lead to both increased heat and ozone (O 3) levels in urban areas over the coming century. To assess potential human health impacts of these changes, models are needed for projecting regional-scale temperature and O 3 changes under climate change, and for characterizing the independent and joint health effects of heat and O 3 . To meet these needs, mortality transfer functions for summer heat and O 3 were developed and applied in a regional health risk assessment for the New York City metropolitan region. The objective was to analyze and project the relative impacts of climate-related changes in mean daily temperature and 1-hour maximum O 3 concentrations on acute non-accidental mortality from all internal causes of death. Exposure-response relationships were developed using a 10-year record of daily summer observations for the region (1990–1999). This was done using a time series Poisson regression model that jointly estimated O 3 and temperature effects on mortality, controlling for time trends and day of week effects. To project impacts into future decades, we developed a integrated modeling system that took global scale climate projections for the 2020s, 2050s, and 2080s, using the Intergovernmental Panel on Climate Change (IPCC) A2 and B2 emission scenario assumptions, and down-scaled these to a 36 km grid using regional models for climate and air quality. Regional downscaling was carried out using the GISS-MM5 linked global-regional model system for climate and the Community Multiscale Air Quality (CMAQ) model for air quality. Mortality risks were projected using the transfer functions estimated from the 1990s data. Results showed that both O 3 and heat stress had measurable impacts on mortality risk, but that the relative impacts changed over time. This modeling strategy could be applied in other metropolitan areas and for other health outcomes to assess health impacts of heat and O 3 under a changing climate.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Temperature

Air Pollution: Interaction with Temperature, Ozone

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content